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The New Age of Scientific Partnerships: Acoustic Capabilities and Facilities at NUWC Division, Newport -- Surface ASW Directorate Outlook

Presented at the 127th Meeting of the Acoustical Society of America, 6-10 June 1994, Cambridge, Massachusetts

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PREFACE

The work described in this document was performed in support of two efforts: the Shallow Water Active Classification Project and the Surface ASW Directorate Plans and Analysis Initiative. The Shallow Water Active Classification Project is part of the Submarine/Surface Ship USW Surveillance Block Program sponsored by the Technology Directorate of the Office of Naval Research (ONR); Program Element 602314N, ONR Block Program UN3B, Project No. RJ14B85, NUWC Division Newport Job Order No. B64600; Principal Investigator Joseph M. Monti (Code 33A), Program Director G. C. Connolly (Code 2192). The ONR Associate Director, Undersea Surveillance Division is T. G. Goldsberry (ONR-4510). The Plans and Analysis Initiative is part of the Surface ASW Directorate NUWC Division Newport Detachment New London under Job Order No. 630K12; Principal Investigator/Program Manager Peter D. Herstein (Code 304).

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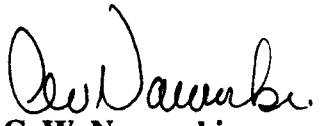

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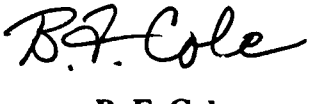
Head: ASW Systems Department



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THE NEW AGE OF SCIENTIFIC PARTNERSHIPS: ACOUSTIC CAPABILITIES AND FACILITIES AT NUWC SURFACE ASW DIRECTORATE OUTLOOK

PRESENTED TO THE 127TH MEETING OF THE ACOUSTICAL SOCIETY OF AMERICA

7 JUNE 1994

PETER D. HERSTEIN (PRESENTER)

JOSEPH M. MONTI

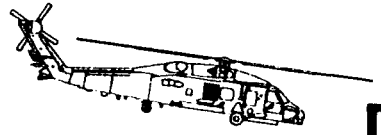
DAVID G. BROWNING

NAVAL UNDERSEA WARFARE CENTER, DIV NEWPORT, DET NEW LONDON

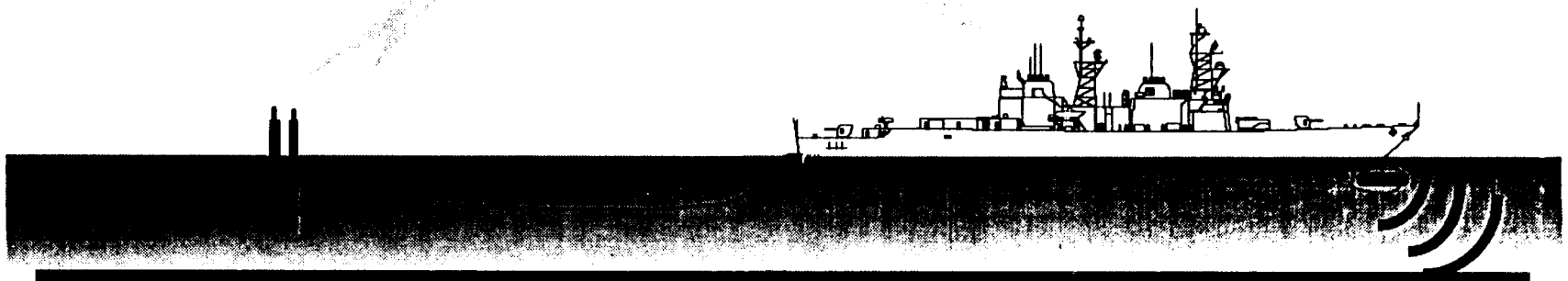
NEW WORLD ORDER

HOW CAN NAVY RDT&E, INDUSTRY, AND ACADEMIA HELP EACH OTHER TO FIND ANSWERS MORE ECONOMICALLY AND EFFICIENTLY?

HOW CAN WE JOIN TOGETHER IN NEW ENDEAVORS?

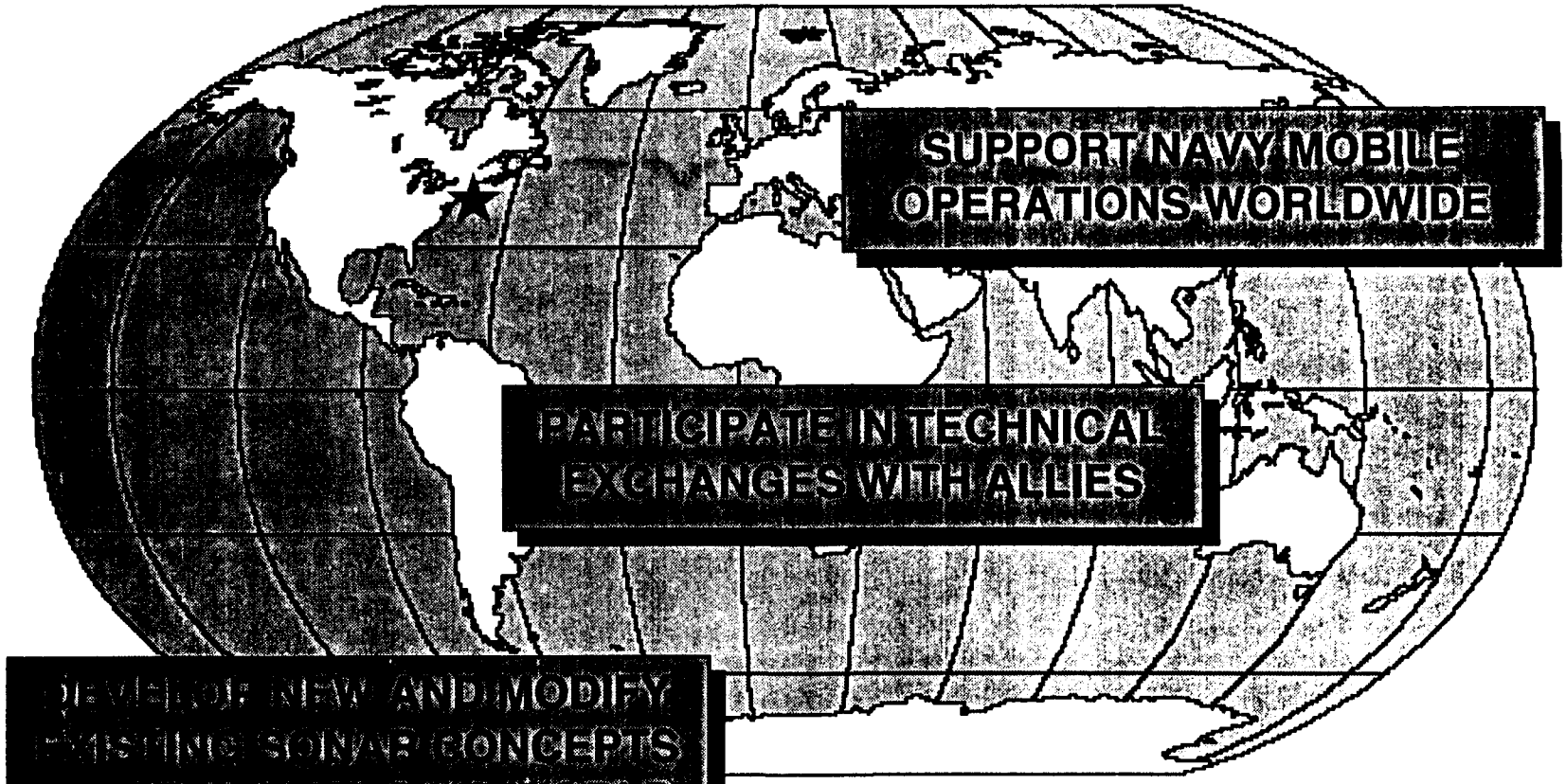


SURFACE ASW DIRECTORATE PROGRAMS

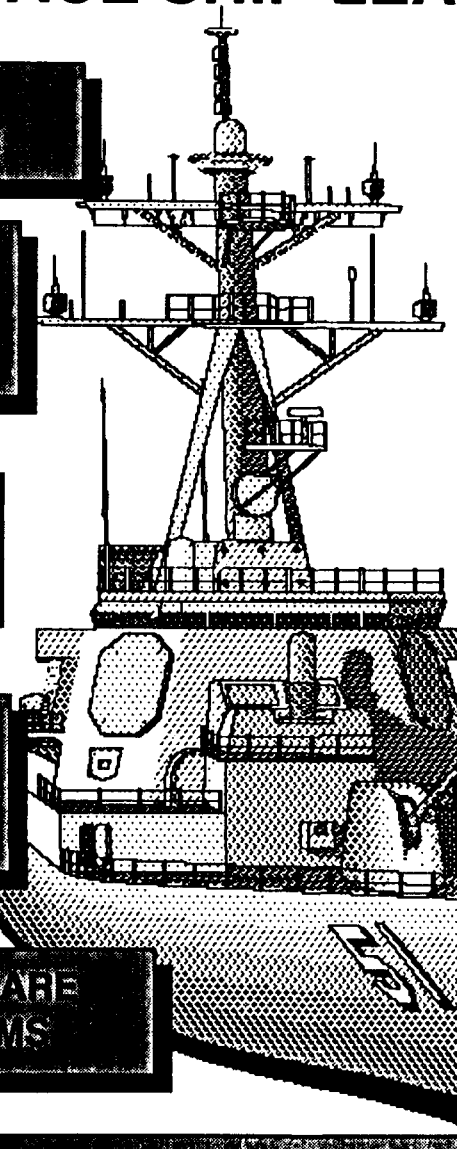


COMBAT/SONAR SYSTEMS	SUPPORTING PROGRAMS	SELF-DEFENSE
• AN/SQQ-89(V) ASW SYSTEM – AN/SQS-53 B,C – AN/SQR-19 – AN/SQQ-28 – AN/UYQ-25 – AN/SQQ-89 ON BOARD TRAINER • AN/SQS-53A EC-16 • AN/SQR-18A(V)3 TOWED ARRAY MULTI-STATIC RECEIVER • *SHALLOW WATER ACTIVE TESTBED (SWAT)* • *LIGHTWEIGHT BROADBAND VARIABLE DEPTH SONAR (LBVDS)* • *AN/SQR-19 TOWED ACTIVE RECEIVER SYSTEM (TARS)*	• SURFACE ASW ADVANCED DEVELOPMENT (SASWAD) • 6.2 SHALLOW WATER ACTIVE ACOUSTICS, ACTIVE CLASS, AND DATA FUSION • TACTICAL ASW INTEGRATED TRAINER (TASWIT) • COMBATANT DATA COLLECTION (CDC) • AN/UYQ-65 DISPLAY STATION • FULL SPECTRUM PROCESSING-MAC DSP • SPP-ADM (SENSOR PERFORMANCE PREDICTION - ADVANCED DEVELOPMENT MODEL)	• KINGFISHER • NATIONAL SURFACE SHIP TORPEDO DEFENSE (SSTD) • US/UK JOINT SSTD • TORPEDO COUNTERMEASURES (NIXIE, ATT, LEAD) • AN/SQQ-89 TORPEDO RECOGNITION PROCESSOR (TRP)

NUWC SURFACE ASW DIRECTORATE: SUPPORTING U.S. NAVY SURFACE COMBATANT USW SYSTEMS WORLDWIDE



NUWC SURFACE SHIP LEADERSHIP AREAS



SONAR SYSTEMS

HULL-MOUNTED AND TOWED ARRAYS (SOURCES AND RECEIVERS)

MINE AVOIDANCE SONAR SYSTEMS

UNDERSEA WARFARE MODELING AND ANALYSIS

UNDERSEA WARFARE COMBAT SYSTEMS

TORPEDO COUNTERMEASURES

TORPEDO LAUNCHER SYSTEMS

COUNTERMEASURE LAUNCHER SYSTEMS

TORPEDOES

UNDERSEA VEHICLES (UUVs &TARGETS)

TACTICAL UNDERSEA RANGES

TACTICAL WARFARE TRAINERS FOR SURFACE SHIP USW

TECHNICAL COMPETENCIES OF THE SURFACE ASW DIRECTORATE

- SPHERICAL ARRAY ACOUSTICS EXPERTS IN:
- ENVIRONMENTAL ACOUSTICS
- TARGET CLASSIFICATION
- ACTIVE SONAR SYSTEMS (ACTIVE)
- TARGET STRENGTH MEASUREMENTS
- SYSTEMS ARCHITECTURE AND ENGINEERING

SINCE 1 JUNE 1990...

OVER 105 ARTICLES PUBLISHED IN REFEREED JOURNALS

OVER 35 PUBLISHED AUTHORS

30 PhD's

103 MASTERS DEGREES

REPRESENTATIVE PATENTS APPLIED FOR SINCE 1990

ENVIRONMENTAL ACOUSTIC PROBE PULSE TECHNIQUE	COLE et al
ELECTRO-OPTICAL COAXIAL TOW CABLE	SEAMAN et al
SNAP-BOLT SUPPRESSION SYSTEM	RUFFA
METHOD AND MEANS FOR ISOLATING EQUIPMENT FROM SHOCK LOADS	RYDBERG

NUWC DIVISION NEWPORT

SURFACE SHIP SONAR FACILITIES

RESEARCH & DEVELOPMENT
PERFORMANCE CHARACTERIZATION
IN-SERVICE SUPPORT

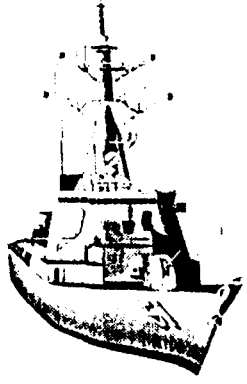
SURFACE SHIP TORPEDO DEFENSE

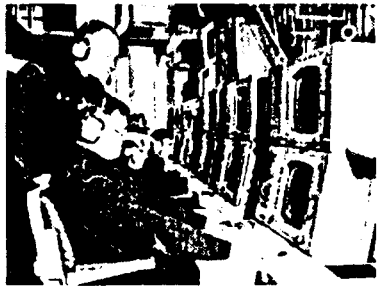
- US/UK AND NATIONAL PROGRAMS
- DETECTION/CLASSIFICATION/LOCALIZATION
- THREAT EVALUATION

SONAR DEVELOPMENT & EVALUATION COMPLEX

- SIGNAL AND DATA PROCESSING
- OPERABILITY
- ACOUSTIC DATA FUSION

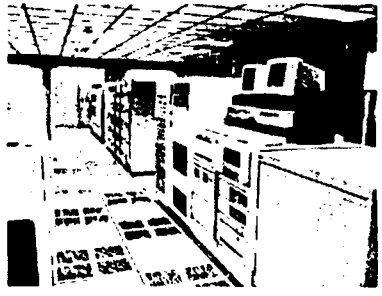
OUR CUSTOMER:
THE SURFACE COMBATANT NAVY





SQQ-89 LAND BASED INTEGRATED TEST SITE

- SOFTWARE LIFE CYCLE SUPPORT
- PRODUCT IMPROVEMENT
- FLEET PROBLEM RESOLUTION AND TRAINING

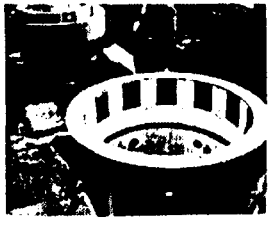


TACTICAL SONAR MEASUREMENTS & ANALYSIS

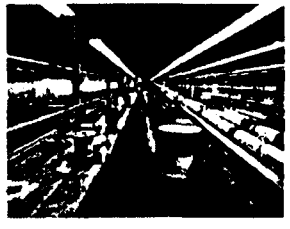
- UNDERWATER ACOUSTICS MODELING AND SIMULATION
- SONAR PERFORMANCE MODELING AND SIMULATION
- TACTICAL EXERCISE RECONSTRUCTION AND ANALYSIS

RELATED SUPPORT FACILITIES

SONAR ARRAY MICROELECTRONICS



ENVIRONMENTAL TEST



TOWED ARRAY COMPLEX

PIER 7

NUWC DIVISION NEWPORT

NUWC HAS A LONG HISTORY OF COOPERATION WITH THE NON-MILITARY RESEARCH COMMUNITY

GENERAL ADMINISTRATION

NAVAL UNDERSEA WARFARE CENTER (NUWC)

TECHNICAL COORDINATION

- SMITHSONIAN INSTITUTION (ECOLOGY)
- NAVAL OCEANOGRAPHIC OFFICE (NAVOCEANO) (MILITARY ASPECTS)

EXAMPLE: OCEAN ACRE 1967-1978

ACOUSTICS

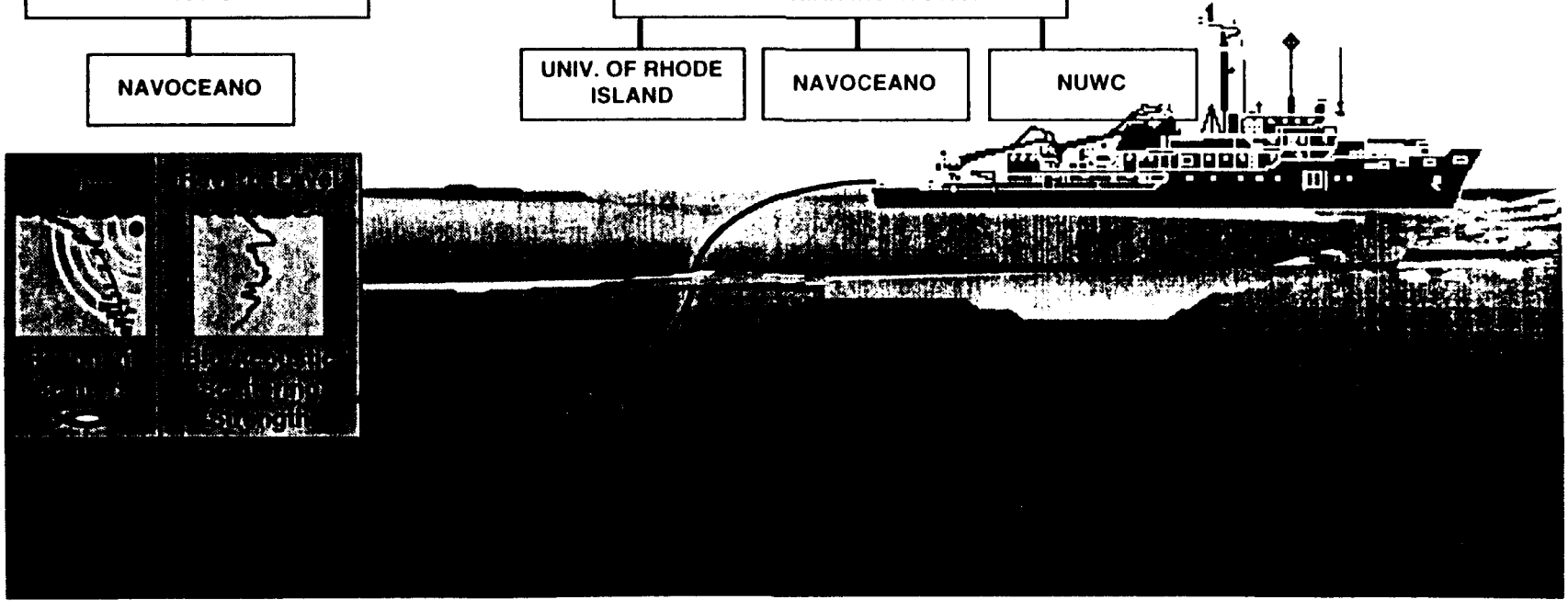
NUWC

- NAVOCEANO

BIOLOGICAL OCEANOGRAPHY

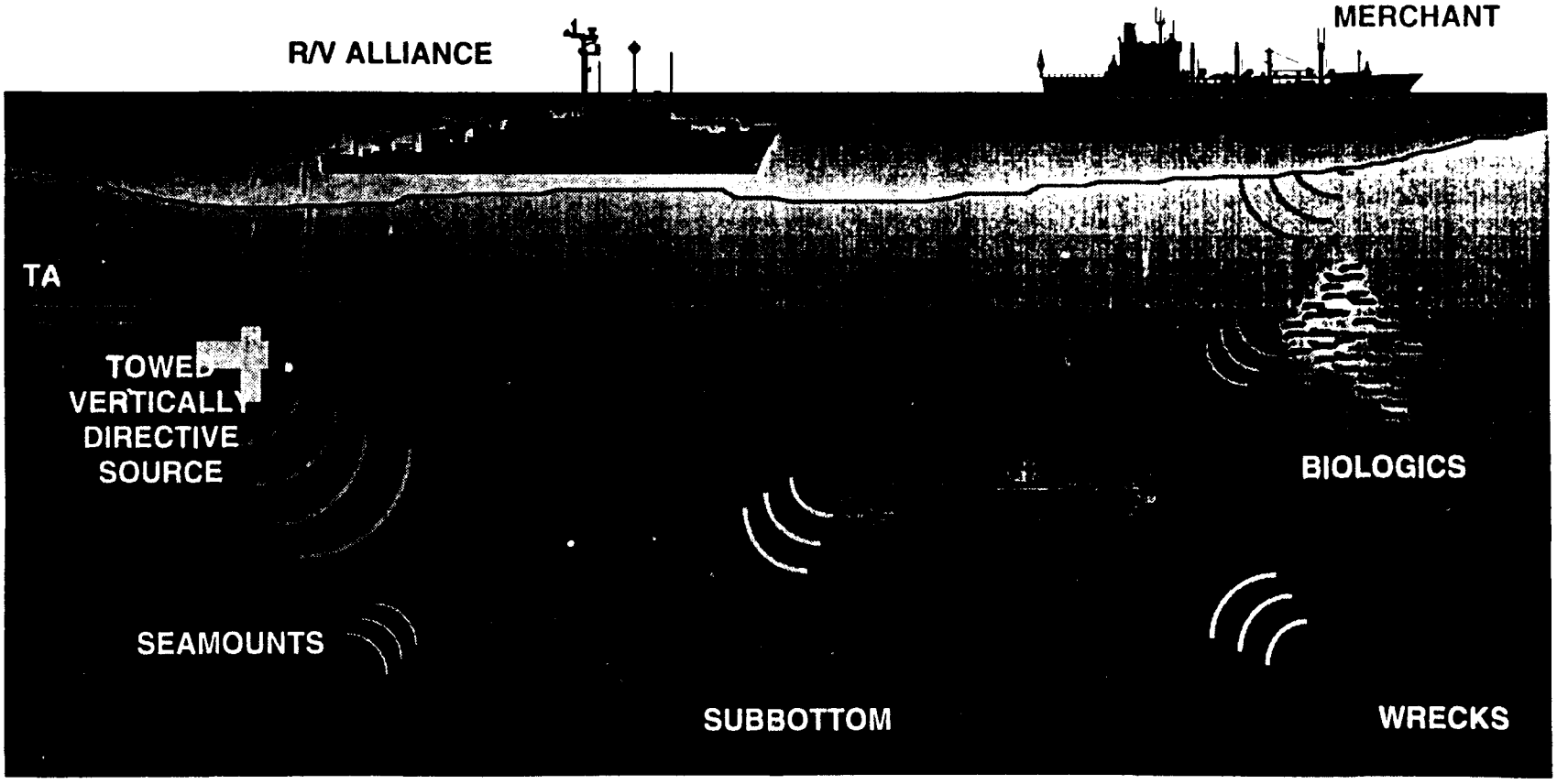
SMITHSONIAN INSTITUTION

- UNIV. OF RHODE ISLAND
- NAVOCEANO
- NUWC



PLANNING AND COORDINATING
COMBINED SEA TRIALS WITH
SWAC II AND SACLANTCEN TO COLLECT
SHALLOW WATER CLUTTER AND
TARGET IN ENVIRONMENT DATA
FOR ACTIVE CLASSIFICATION
TECHNOLOGY DEVELOPMENT

SWAC II
SEA TRIAL



INDUSTRY IR&D TRANSITIONED TO NAVY PROGRAMS: ADAPTIVE CLUTTER FILTER (ACF) TECHNOLOGY EXAMPLE

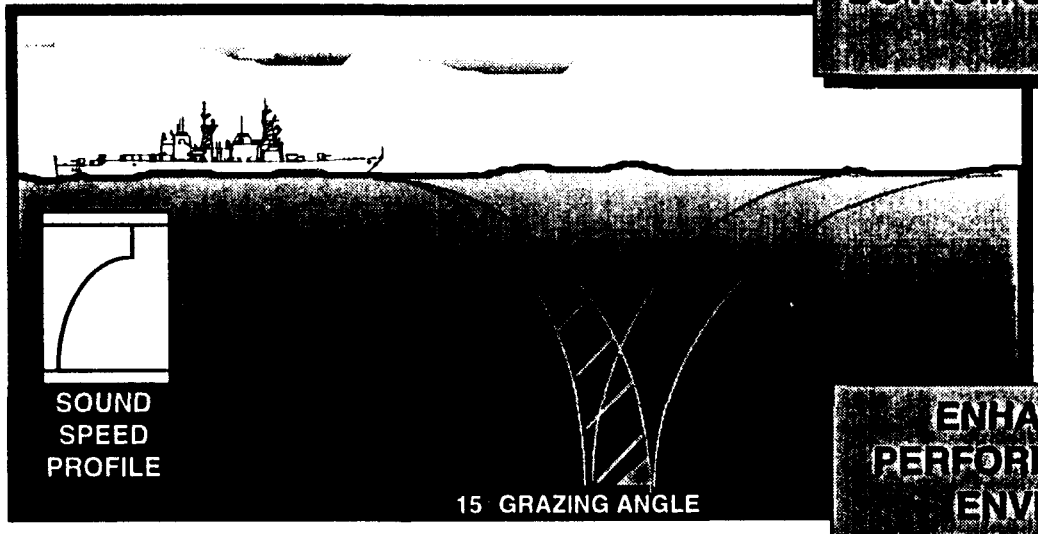
1987-88 (CEP IR&D)	• DEVELOPED ADAPTIVE CLUTTER SUPPRESSION FILTER TECHNOLOGY FOR AN INFRARED SENSOR APPLICATION
1989-90 (NUWC/DARPA)	• ENHANCED AND COMPREHENSIVELY EVALUATED ADAPTIVE CLUTTER FILTER TECHNOLOGY
1990-91 (CEP IR&D)	• TRANSITIONED AND MODIFIED ACF TECHNOLOGY FOR ASW DETECTION AND CLASSIFICATION APPLICATION
1992 (NUWC 6.2)	• REFINED AND EVALUATED ACF TECHNOLOGY WITH USS STUMP SQS-53C SHALLOW WATER SONAR DATA
1993-94 (NUWC 6.2)	• INTRODUCED AN ENVIRONMENTAL TARGET ESTIMATION MODEL INTO THE ACF DESIGN AND DEMONSTRATED PERFORMANCE WITH HEAVY CLUTTER IN SHALLOW WATER
1994-95 (NUWC 6.2)	• ENHANCE TARGET ESTIMATION MODEL AND COMPREHENSIVELY EVALUATE ACF PERFORMANCE. DEVELOP AND DEMONSTRATE ACF EXTENSIONS

TECHNOLOGY RELEVANCY
ACTIVE CLUTTER FILTER EXAMPLE

- MILITARY NEED
  - REJECTION OF ECHOES WHICH ARE NOT SUBMARINES

- COMMERCIAL / ACADEMIC APPLICATIONS
  - BIO MASS ESTIMATION
  - BATHYMETRIC FEATURE MAPPING
  - WARNING FOR HAZARDS TO NAVIGATION

COMBATANT DATA COLLECTION DEMONSTRATION (CDC)
BOTTOM SCATTER AND BOTTOM LOSS IN SHALLOW WATER



ENHANCED SENSOR/PLATFORM PERFORMANCE BY REAL TIME IN SITU ENVIRONMENTAL/ACOUSTICS MEASUREMENTS AND MODELING

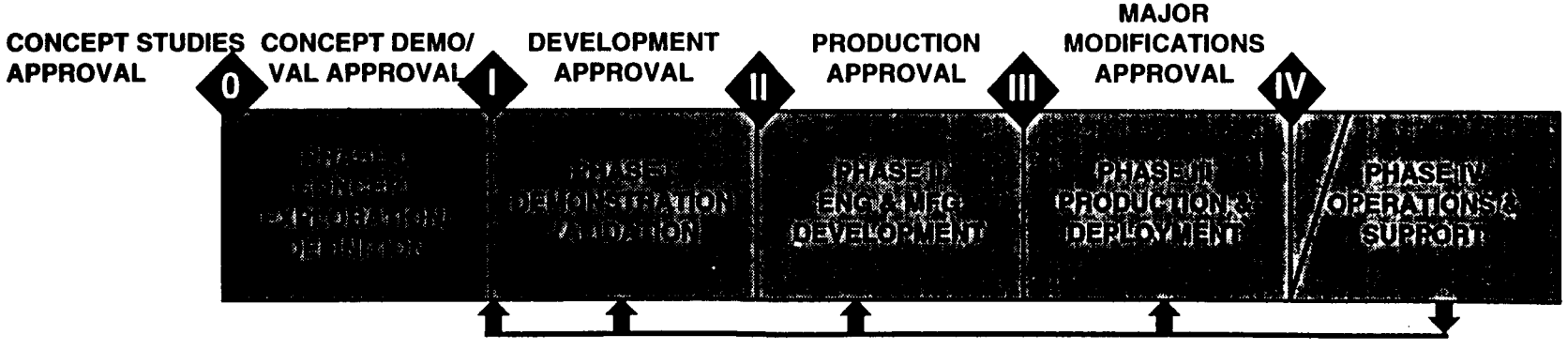
- SONAR PERFORMANCE VARIABILITY ASSOCIATED WITH SHALLOW WATER REQUIRES UNDERWATER ACOUSTIC IN SITU DATA COLLECTIONS FOR REALISTIC PERFORMANCE PREDICTIONS
- COMPONENTS
  - ENVIRONMENTAL MONITORS
  - HIGH FIDELITY AND HIGH SPEED ACOUSTIC MODELS
  - USE OF "PROBE PULSES"
  - DIGITAL RECORDERS
  - HIGH SPEED PROCESSORS
  - RAPID PARAMETRIC EXTRACTION AND PERFORMANCE ASSESSMENTS
  - DISPLAY ENHANCEMENTS

NUWC PROVIDES "CRADLE TO GRAVE" SMART BUYER FUNCTIONS

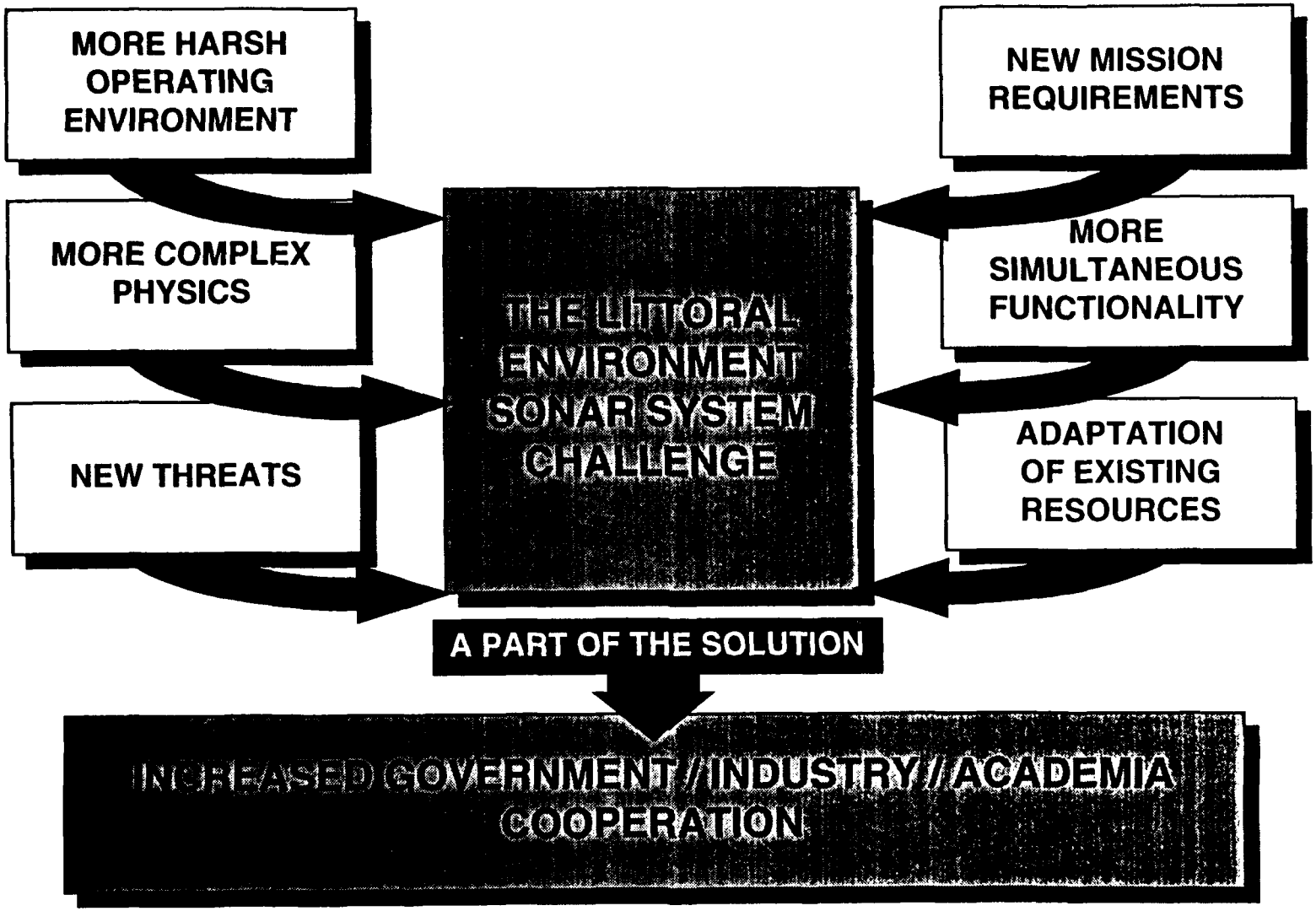
DRIVERS

SCIENCE & TECHNOLOGY
WARFARE ANALYSIS
ADVANCED DEVELOPMENT
SYSTEMS ENGINEERING

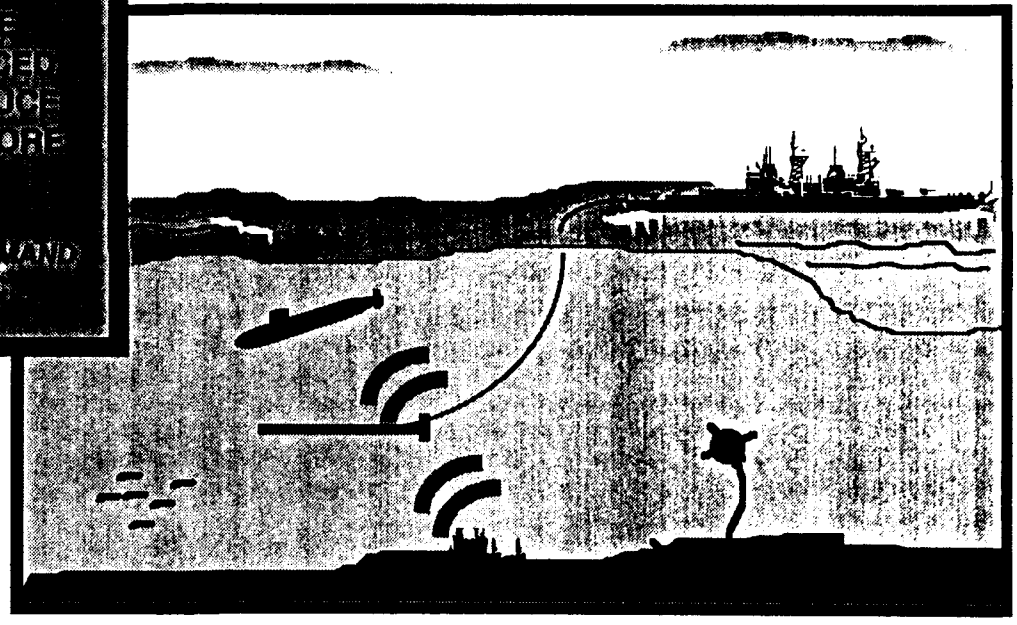
ACQUISITION PHASES & MILESTONES



WHY WE MUST WORK TOGETHER



LIGHTWEIGHT BROADBAND VARIABLE DEPTH SONAR (LBVDS) A JOINT MARTIN MARIETTA/NUWC ATD PROGRAM



- LBVDS CAPITALIZES ON RECENT SYNERGISTIC INDUSTRY–NAVY TECHNOLOGY BREAKTHROUGHS TO DEMONSTRATE A NEW SONAR SYSTEM BY COMBINING AND APPLYING NEW TECHNOLOGIES IN:
  - BROADBAND SIGNAL GENERATION AND PROCESSING
  - ENERGY DENSE TRANSDUCER MATERIALS
  - SPARSE RECEIVER LINE ARRAYS

SUMMARY

- CHANGING NATIONAL AND WORLD PRIORITIES HAVE INCREASED THE NEED FOR CREATIVE AND EFFICIENT JOINT ENDEAVORS BETWEEN NAVAL RDT&E CENTERS, INDUSTRY, AND ACADEMIA
- THE SURFACE ASW DIRECTORATE SUPPORTS THE U.S. NAVY FROM "CRADLE TO GRAVE" IN ALL ASPECTS OF SURFACE SHIP SONARS AND THEIR INTEGRATION AS COMBAT SYSTEM ELEMENTS
- THE DIRECTORATE HAS A HISTORY OF ENCOURAGING MUTUAL EFFORTS AND WE ESPECIALLY WELCOME THEM NOW

FOR FURTHER INFORMATION CONTACT:
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